SOME ASPECTS OF BLUNT ABDOMINAL TRAUMA

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Abstract: MDCT is the modality of choice for the comprehensive imaging evaluation of patients with blunt abdominal and pelvic trauma. Errors in the interpretation of trauma MDCT may cause disastrous consequences. This chapter will discuss the most challenging MDCT findings in patients with abdominal and pelvic trauma, and will emphasize the practical solutions to avoid delayed diagnosis of these potentially life-threatening injuries.
Keywords: Trauma, treatment, diagnosis, method.

INTRODUCTION

Abdominal and pelvic trauma is generally divided into blunt and penetrating trauma. Blunt trauma can affect any intraabdominal or intrapelvic organ, and the injuries may not always be apparent clinically. This is especially the case in severe polytrauma. Prompt and accurate diagnosis is essential in such patients, hopefully resulting in timely treatment and rapid recovery with minimal or no morbidity [1]. The role of the radiologist is vital in assessing patients with blunt abdominal and pelvic trauma and in establishing accurate diagnoses. It is essential to be aware to the scope of blunt abdominal and pelvic traumatic injuries and to be comfortable with the spectrum of MDCT findings associated with them.

MATERIALS AND METHODS

Blunt abdominal traumatic injuries can result from a number of mechanisms, including motor vehicle accidents, falls from a height, assaults, and sports injuries [1]. A substantial force is usually needed to cause injury to the solid or hollow abdomen and pelvic viscera. These include rapid decelerations, external compression, and crushing injuries [1]. Deceleration injuries are associated with tears at points of fixation, including vascular pedicles and mesenteric attachments. External compression, when substantial, can cause a sudden increase in intraabdominal pressure, and can result in rupture of hollow viscera. Crushing injuries result in various patterns of organ damage resulting from the pressing of abdominal contents between the abdominal wall and the spine or bones of the chest wall [1].

RESULTS AND DISCUSSION

MDCT offers improved diagnostic capability, speed, and patient safety compared with older CT technologies [1]. Optimizing the MDCT technique for patients with blunt abdominal and pelvic trauma requires accounting for several factors of image acquisition and interpretation. First and foremost is the appropriate use of IV contrast, as well as acquiring the appropriate number of phases of contrast-enhanced images with correct timing [1]. For instance, arterial phase images are valuable to view splenic and pelvic bleeding and, in conjunction with venous phase images, allow differentiation between arterial and venous sources of hemorrhage [9, 10]. Selective use of delayed phase imaging is useful in assessing for renal and ureteral injuries [11]. A dedicated CT cystogram with injection of diluted iodinated contrast directly into the bladder assesses for bladder injury, including distinguishing intraperitoneal from extraperitoneal rupture [12].

A typical MDCT trauma protocol for the abdomen and pelvis in a patient with severe polytrauma at our institution includes arterial phase images, acquired 25–30 seconds following IV contrast injection [1, 14, 15]. These arterial phase CT images permit detection of injuries to major vessels and solid organ vascular injuries, which may not otherwise be apparent on the venous phase or delayed phase images [1]. And, with the speed of 64-detector scanners and beyond, arterial phase images can be integrated into multiphasic protocols using a single bolus of IV contrast [1].

Next are the portal venous phase images (acquired at 65–80 seconds following IV contrast injection), which offer a good compromise to maximize detection of parenchymal injuries [1]. Delayed phase CT images (acquired at 5–10 minutes following IV contrast injection) should be

selectively used in patients with suspected urinary tract injuries, as well as for further characterization of solid visceral organ injuries involving the vasculature [1, 11, 16]. Moreover, in patients with suspected bladder injury, CT cystography should be performed, which requires 300–400 mL of diluted water-soluble contrast material (e.g., solution of 40 mL of contrast and 360 mL of normal saline) to be instilled into the bladder via a Foley catheter [1].

The current methods of image reconstruction and postprocessing, including multiplanar and 3D reformations, should also be used to maximum potential to aid both the radiologist and clinician in making diagnoses and managing patients [1, 12, 17, 18].

Although it is somewhat less of a concern in acute trauma, managing the radiation dose delivered to the patient with trauma should nevertheless be made a priority. The dose used should be the minimum necessary as to not compromise quality or obscure important findings [1].

Diaphragmatic injuries in blunt trauma result from a sudden increase in intraabdominal pressure [1]. These injuries can have significant morbidity and mortality associated with immediate or delayed herniation and secondary ischemia of abdominal organs extending into the thoracic cavity [18]. Although the diagnostic accuracy of CT for the detection of diaphragmatic injuries has been historically low, particularly with right-sided injuries, MDCT has allowed improved accuracy through higher spatial resolution and improved multiplanar reformations [1].

Bowel injuries often present with subtle findings that may be over- looked. Unfortunately, even with short delays in diagnosis, as few as 5–8 hours, can have dire consequences, with increased morbidity and mortality from peritonitis and sepsis [25, 26]. Some authorities advocate repeat MDCT 12–24 hours following the initial CT scan in patients with a high risk of bowel injury or questionable findings on the initial images [27]. However, one should consider shortening the time interval to 6–8 hours, or even less, as indicated by the particular circumstances [19]. CT sensitivity for the detection of bowel and mesenteric injuries ranges between 70% and 95%, and specificity varies between 92% and 100% [1]. Some of the direct signs include bowel wall discontinuity, extraluminal gas, and extraluminal oral contrast (when administered), which is not done currently for almost any initial CT scan of trauma but may be helpful for short-term repeat CT [28]. Although these CT signs are specific, they are not highly sensitive.

CONCLUSION

Blunt abdominal trauma is a common scenario encountered in the emergency radiology setting. There are many challenges associated with dealing with such patients, including optimizing the imaging technique as well as efficient and accurate image interpretation to allow timely management. The radiologist should be aware of the spectrum of MDCT findings associated with blunt abdominal and pelvic trauma, including common misses and challenging presentations.

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